

Claims

us 9,76

We Claim:

1. A device comprising:
  - a plurality of LEDs that produce at least two different spectra;
  - 6 a material configured to receive light emitted from the plurality of LEDs, and to display a color that is a combination of the spectra of the plurality of LEDs;
  - a processor, the processor generating a control signal, the control signal changing over time to produce from the consumer product a color-changing effect; and
  - a controller that receives the control signal, the controller controlling power delivered to one or more of the plurality of LEDs in response to the control signal; and
  - 12 a user interface adapted to receive a user input to control operation of the processor.
2. The device of claim 1 wherein the processor operates in one of a plurality of modes, each mode producing a lighting effect according to one or more parameters.
- 18 3. The device of claim 1 wherein the user interface consists of a single button.
4. The device of claim 1 wherein the user interface consists of two buttons.
5. The device of claim 1 wherein the user interface includes an adjustable input.
- 24 6. The device of claim 1 wherein the user interface includes at least one of a button, a dial, a slider, a knob, or a keypad.
7. The device of claim 1 wherein the color-changing effect includes at least one of a color wash, a strobe, a fade, or a Holiday lighting effect.
- 30 8. The device of claim 1 wherein the device comprises a consumer product.

9. A lighting system comprising:

two or more LEDs wherein the two or more LEDs produce at least two different spectra;

a processor;

6 a controller wherein the controller controls power delivered to at least one of the two or more LEDs;

the controller further comprising a signal input wherein the signal input is associated with the processor and being responsive to signals communicated to the signal input; and

a light-transmissive material wherein the LEDs are arranged to operatively associate with the material.

10. A lighting system of claim 9 further comprising a user interface wherein the user interface is associated with the processor.

11. A lighting system of claim 10 further comprising a memory wherein the memory is associated with the processor.

12. A lighting system of claim 11 wherein the user interface supplies at least one of a logic high signal and logic low signal to the processor wherein the processor selects a program from the memory upon receipt of a user interface signal.

13. A lighting system of claim 11 wherein the user interface supplies at least one of a logic high signal and logic low signal to the processor wherein the processor adjusts a program parameter upon receipt of a user interface signal.

14. A lighting system of claim 9 wherein the processor further comprises a timer; the timer measuring the duration of the user interface signal and the processor adjusting a parameter of the program upon receipt of a predetermined duration of the user interface signal.

15. A lighting system of claim 14 wherein the parameter continues to change until the user interface signal changes.

16. A lighting system of claim 11 further comprising a housing wherein the LEDs,  
6 processor, memory, and controllers are substantially enclosed by the housing, and  
wherein the user interface is associated with the housing and the light-transmissive  
material is associated with the housing.

17. A lighting system of claim 11 further comprising:  
a housing wherein the housing substantially encloses the processor, memory, and  
12 controllers;  
a second housing wherein the second housing substantially encloses the at least  
two LEDs; and  
the light-transmissive material is associated with the second housing.

18. A lighting system of claim 9 wherein the light-transmissive material comprises at  
18 least one of a semitransparent material, translucent material, semitransparent material and  
transparent material.

19. A lighting system of claim 9 wherein the at least two controllers are at least one of  
a pulse width modulator, pulse amplitude modulator, pulse displacement modulator,  
resistor ladder, current source, voltage source, voltage ladder, switch, transistor, and  
24 voltage controller.

20. A lighting system of claim 11 wherein the user interface comprises an encoder  
wherein the encoder provides an encoder signal; the processor changes at least one of a  
program and program parameter upon receipt of the encoder signal.

30 21. A lighting system of claim 20 wherein the user interface further comprises at least  
one of a dial, button, switch, slider, variable switch, and variable selector.

22. A lighting system of claim 12 or 13 wherein the user interface further comprises at least one of a button and switch.

23. A lighting system of claim 10 further comprising:  
 6 an analog to digital converter;  
 wherein the user interface generates an analog signal and the analog to digital converter converts the analog signal to a digital signal; and  
 the digital signal is communicated to the processor.

24. A lighting system of claim 23 further comprising memory wherein the processor  
 12 selects a program from memory upon receipt of the digital signal.

25. A lighting system of claim 23 further comprising memory wherein the processor  
 adjusts a parameter of a program upon receipt of the digital signal.

26. A lighting system comprising:  
 18 at least two LEDs wherein the at least two LEDs produce at least two different spectra;

a processor;

a power converter wherein the power converter converts a power supply power  
 into power for at least one of the processor and LEDs;

24 at least two controllers wherein the controllers independently control power  
 delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal  
 input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal  
 input; and

30 a light-transmissive material wherein the LEDs are arranged to illuminate the  
 light-transmissive material.

27. A lighting system of claim 26 further comprising a user interface wherein the user interface is associated with the processor.

28. A lighting system of claim 27 further comprising memory wherein the memory is associated with the processor.

6

29. A lighting system of claim 28 wherein the user interface supplies at least one of a logic high signal and logic low signal to the processor wherein the processor selects a program from the memory upon receipt of a user interface signal.

12 30. A lighting system of claim 28 wherein the user interface supplies at least one of a logic high signal and logic low signal to the processor wherein the processor adjusts a program parameter upon receipt of a user interface signal.

18 31. A lighting system of claim 29 wherein the processor further comprises a timer; the timer measures the duration of the user interface signal and the processor adjusts a parameter of the program upon receipt of a predetermined duration of the user interface signal.

32. A lighting system of claim 31 wherein the parameter continues to change until the user interface signal changes.

24 33. A lighting system of claim 28 further comprising:  
a housing wherein the LEDs, processor, memory, and controllers are substantially enclosed by the housing;

the user interface is associated with the housing; and

the light-transmissive material is associated with the housing.

30 34. A lighting system of claim 26 wherein the at least two controllers comprise at least one of a pulse width modulator, pulse amplitude modulator, pulse displacement

modulator, resistor ladder, voltage ladder, current source, voltage source, switch, transistor, and voltage controller.

35. A lighting system of claim 28 wherein the user interface is an encoder wherein the encoder provides an encoder signal; the processor changes at least one of a program and  
6 program parameter upon receipt of the encoder signal.

36. A lighting system of claim 35 wherein the user interface further comprises at least one of a dial, button, switch, slider, variable switch, and variable selector.

12 37. A lighting system of claim 29 or 30 wherein the user interface is at least one of a button and switch.

38. A lighting system of claim 27 further comprising:  
an analog to digital converter;  
wherein the user interface generates an analog signal and the analog to digital  
converter converts the signal to a digital signal; and  
18 the processor receives the digital signal.

39. A lighting system of claim 38 further comprising memory wherein the processor selects a program from memory upon receipt of the digital signal.

24 40. A lighting system of claim 38 further comprising memory wherein the processor adjusts a parameter of a program upon receipt of the digital signal.

41. A lighting system of claim 26 further comprising a detachable optic.

42. A lighting system of claim 41 wherein the optic is a lens, secondary optic, holographic lens, anamorphic lens, and patterned lens.

43. A lighting system of claim 10 or 27 further comprising a display; wherein the display is associated with the processor.

44. A lighting system of claim 43 wherein the display is at least one of an LCD screen, plasma screen, monochrome screen, color screen and a screen.

6

45. A lighting system of claim 44 wherein the display displays information regarding information regarding at least one of a program, program setting, program parameter, available programs, time, date, and control information.

46. A lighting system of claim 26 further comprising:

12

memory wherein the memory is associated with the processor;

an energy storage element wherein the energy storage element is associated with a power source;

the energy storage element communicates at least one of a high logic signal and a low logic signal to the processor;

18

wherein a logic is formed when the logic signal changes from its original state to a second state and then back to the original state;

wherein the processor selects a program from the memory upon receipt of a logic cycle within a predetermined period of time.

47. A lighting system of claim 46 wherein the energy storage element is at least one of a capacitor, non-volatile memory, relay, and storage device.

24

48. A lighting system of claim 46 further comprising:

a last program wherein the last program comprises the program that was active prior to de-energizing the lighting system;

wherein the memory is at least one of non-volatile memory, and battery backed memory;

30

wherein the processor selects the last program upon re-energizing the lighting system after a predetermined period of time.

49. A lighting system of claim 26 wherein the light-transmissive material is a lens, secondary optic, holographic lens, anamorphic lens, and patterned lens.

50. A lighting system of claim of 10 or 27 wherein the user interface is remotely  
6 located from the processor.

51. A lighting system of claim 50 wherein the communication from the user interface to the processor is accomplished through at least one of an electromagnetic transmission, radio frequency transmission, infrared transmission, microwave transmission, acoustic transmission, wire transmission, cable transmission, and network transmission.

12

52. An ornamental lighting system comprising:  
at least two LEDs wherein the at least two LEDs produce at least two different spectra;

a processor;

18

at least two controllers wherein the controllers independently control power delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal input;

24

a light-transmissive material wherein the LEDs are arranged to illuminate the light-transmissive.

a user interface wherein the user interface is associated with the processor; and memory wherein the memory is associated with the processor.

53. An ornamental lighting system comprising:  
at least two LEDs wherein the at least two LEDs produce at least two different spectra;

30

a processor;



a power converter wherein the power converter converts power from a power supply power into power for at least one of the processor and LEDs;

at least two controllers wherein the controllers independently control power delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal input;

a light-transmissive material wherein the LEDs are arranged to illuminate the light-transmissive material;

a user interface wherein the user interface is associated with the processor; and

memory wherein the memory is associated with the processor.

54. A nightlight comprising:

at least two LEDs wherein the at least two LEDs produce at least two different spectra;

a processor;

a power converter wherein the power converter converts the power from a power supply into power for at least one of the processor and LEDs;

at least two controllers wherein the controllers independently control power delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal input; and

a light-transmissive material wherein the LEDs are arranged to illuminate the light-transmissive material.

55. A nightlight of claim 54 further comprising:

a user interface wherein the user interface is associated with the processor; and memory wherein the memory is associated with the processor.

56. A nightlight of claim 54 wherein the LED produce illumination wherein the illumination is projected from the nightlight onto a wall.

57. A nightlight of claim 54 further comprising a second transmissive material  
6 wherein the second transmissive material is detachably connected to the night light.

58. A nightlight of claim 57 wherein the second transmissive material is at least one of a lens, secondary optic, holographic lens, anamorphic lens, and patterned lens.

59. A nightlight of claim 54 further comprising:  
12 memory wherein the memory is associated with the processor;  
an energy storage element wherein the energy storage element is associated with a power source;  
the energy storage element communicates at least one of a high logic signal and a low logic signal to the processor;  
wherein a logic cycle is formed when the logic signal changes from its original  
18 state to a second state and then back to the original state;  
wherein the processor selects a program from the memory upon receipt of a logic cycle within a predetermined period of time.

60. A nightlight of claim 59 further comprising:  
a switch wherein the switch disconnects the nightlight from the power supply.

24

61. A lighted ball comprising:  
at least two LEDs wherein the at least two LEDs produce at least two different spectra;  
a processor;  
at least two controllers wherein the controllers independently control power  
30 delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal input;

6 a ball housing wherein the ball housing comprises a light-transmissive material wherein the LEDs are arranged to illuminate the light-transmissive material;

62. A lighted ball comprising:

at least two LEDs wherein the at least two LEDs produce at least two different spectra;

a processor;

12 at least two controllers wherein the controllers independently control power delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal input;

18 a ball housing wherein the ball housing further comprises a portion of light-transmissive material;

the LEDs are arranged to illuminate the portion of light-transmissive material.

63. A lighted ball of claims 61 or 62 further comprising:

24 a switch associated with the processor wherein the switch comprises at least one of a hall effect switch, motion sensing switch, proximity detector, sensor, transducer, capacitive switch, and inductive switch.

64. A lighted ball of claims 61 or 62 further comprising:

30 a receiver for receiving at least one of a electromagnetic transmission, radio frequency transmission, infrared transmission, microwave transmission, acoustic transmission, network transmission, wire transmission, and cable transmission; wherein the receiver is associated with the processor.

65. A lighted ball of claims 61 or 62 further comprising:  
 an analog to digital converter wherein the analog to digital converter communicates a digital signal to the processor;  
 a receiver for receiving at least one of a electromagnetic transmission, radio frequency transmission, infrared transmission, microwave transmission, acoustic transmission, network transmission, wire transmission, and cable transmission; wherein the receiver communicates an analog signal to the analog to digital converter.

66. A wearable accessory comprising:  
 at least two LEDs wherein the at least two LEDs produce at least two different spectra;

a processor;  
 at least two controllers wherein the controllers independently control power delivered to the at least two LEDs;  
 the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;  
 the at least two controllers are responsive to signals communicated to the signal input;

a housing wherein the housing substantially encloses at least one of the at least two LEDs, processor, and controllers;  
 a light-transmissive material wherein the LEDs are arranged to illuminate the light-transmissive material;

67. A wearable accessory of claim 66 further comprising:  
 a user interface wherein the user interface is associated with the processor; and memory wherein the memory is associated with the processor.

68. A wearable accessory of claim 66 wherein the housing is at least one of jewelry, badge, shoe, sneaker, clothing, apparel, hat, and an ornamental device.

69. A wearable accessory of claim 66 further comprising:  
a second housing wherein the second housing substantially encloses the at least two LEDs and is associated with the light-transmissive material.

70. A wearable accessory of claims 66 wherein the transmissive material comprises at least one of a semitransparent material, translucent material, semitransparent material and transparent material.

71. A wearable accessory of claim 70 wherein the transmissive material further comprises at least one of a pattern, etched surface, and image.

72. A lighting system of claim 9, 26, 51, 53, 54, 61, 62, or 66 wherein the processor is at least one of a controller, addressable controller, microprocessor, microcontroller, addressable microprocessor, computer, programmable processor, programmable controller, dedicated processor, dedicated controller, and integrated circuit.

73. A lighting system of claim 72 further comprising a receiver for receiving at least one of a electromagnetic transmission, radio frequency transmission, infrared transmission, microwave transmission, acoustic transmission, network transmission, wire transmission, and cable transmission; wherein the receiver is associated with the processor.

74. A lighting system of claim 72 further comprising:  
an analog to digital converter wherein the analog to digital converter is communicates a digital signal to the processor;  
a receiver for receiving at least one of a electromagnetic transmission, radio frequency transmission, infrared transmission, microwave transmission, acoustic transmission, network transmission, wire transmission, and cable transmission; wherein the receiver communicates an analog signal to the analog to digital converter.

75. A lighting system of claim 26, 53 or 54 wherein the power converter further comprising a power supply connection; the power connection comprises at least one of a plug, bi-pin base, screw base, base, Edison base, Edison mount spade plug, and power outlet plug.

- 6 76. A digital light engine comprising:
- at least one LED;
  - a processor;
  - at least one controller wherein the controller controls power delivered to the at least one LED;
  - the at least one controller further comprising a signal input wherein the signal input is associated with the processor;
  - the at least one controller being responsive to signals communicated to the power signal input;
  - a housing that encloses the processor and the controller, the at least one LED attached to the housing;

- 18 77. A digital light engine of claim 76 wherein the external input connection comprises at least one receiver wherein the receiver is capable of receiving transmissions of at least one of electromagnetic transmissions, radio frequency transmissions, infrared transmissions, microwave transmissions, acoustic transmissions, wire transmissions, cable transmissions and network transmissions.

- 24 78. A digital light engine of claim 76 wherein the external input connection is a user interface.

79. A digital light engine of claim 78 wherein the user interface is at least one of a button, dial, slider, linear switch, rotary switch, and encoder.

80. A digital light engine of claim of 76 wherein the processor is at least one of a controller, addressable controller, microprocessor, microcontroller, addressable microprocessor, computer, programmable processor, programmable controller, dedicated processor, dedicated controller, and integrated circuit.

6 81. A digital light engine of claim 76 wherein the platform comprises a housing, a light transmitting housing, enclosure and light transmitting enclosure.

82. A digital light engine comprising:

at least two LED wherein the at least two LEDs produce different spectra;  
a processor;

12 at least two controllers wherein the at least two controllers control power delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal input;

18 a platform wherein the at least one LED, processor, and the at least one controller are associated with the platform; and

an external input connection wherein the external input connection is associated with the processor.

83. A digital light engine of claim 82 wherein the external input connection  
24 comprises at least one receiver wherein the receiver is capable of receiving transmissions of at least one of electromagnetic transmissions, radio frequency transmissions, infrared transmissions, microwave transmissions, acoustic transmissions, wire transmissions, cable transmissions and network transmissions.

84. A digital light engine of claim 82 wherein the external input connection is a user  
30 interface.

85. A digital light engine of claim 84 wherein the user interface is at least one of a button, dial, slider, linear switch, rotary switch, and encoder switch.

86. A digital light engine of claim of 82 wherein the processor is at least one of a controller, addressable controller, microprocessor, microcontroller, addressable  
6 microprocessor, computer, programmable processor, programmable controller, dedicated processor, dedicated controller, and integrated circuit.

87. A digital light engine comprising:

at least two LEDs wherein the at least two LEDs produce different spectra;  
a processor;

12 at least two controllers wherein the at least two controllers control power delivered to the at least two LEDs;

the at least two controllers further comprising a signal input wherein the signal input is associated with the processor;

the at least two controllers are responsive to signals communicated to the signal input;

18 a power converter wherein the power converter converts the power from a power supply into power for at least one of the processor and LEDs;

a platform wherein the at least one LED, processor, and the at least one controller are associated with the platform; and

an external input connection wherein the external input connection is associated with the processor.

24

88. A digital light engine of claim 87 wherein the external input connection comprises at least one receiver wherein the receiver is capable of receiving transmissions of at least one of electromagnetic transmissions, radio frequency transmissions, infrared transmissions, microwave transmissions, acoustic transmissions, wire transmissions, cable transmissions and network transmissions.

30



89. A digital light engine of claim 87 wherein the external input connection is a user interface.

90. A digital light engine of claim 89 wherein the user interface is at least one of a button, dial, slider, linear switch, rotary switch, and encoder switch.

6

91. A digital light engine of claim of 87 wherein the processor is at least one of a controller, addressable controller, microprocessor, microcontroller, addressable microprocessor, computer, programmable processor, programmable controller, dedicated processor, dedicated controller, and integrated circuit.

- 12 92. A light apparatus comprising:
- at least one LED;
  - a processor;
  - at least one controller wherein the controller controls power delivered to the at least one LED;
  - the at least one controller further comprising a signal input wherein the signal
  - 18 input is associated with the processor;
  - the at least one controller is responsive to signals communicated to the power signal input;
  - a power converter wherein the power converter converts the power from a power supply into power for at least one of the processor and LEDs;
  - a monitoring device wherein the monitoring device monitors the power supply;
  - 24 the monitoring device further comprising an output wherein the output is associated with the processor.